2016 Building Energy Efficiency Standards

Second CBIA/CEC Forum

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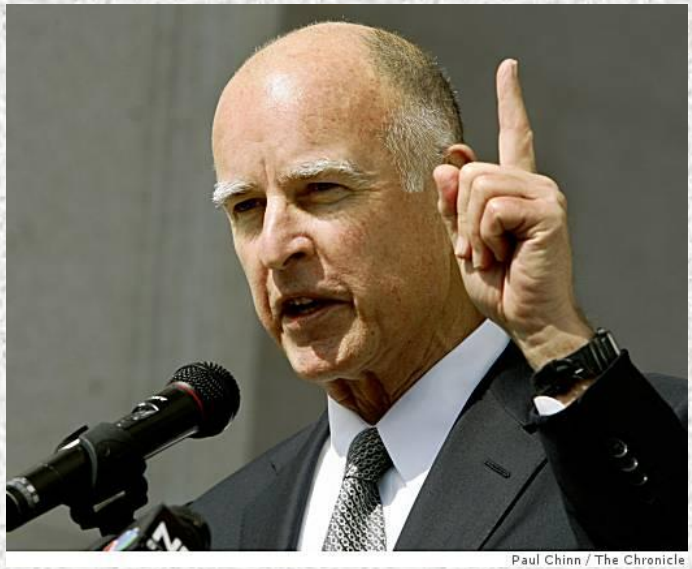
Authority & Process

Public Resources Code (PRC 25402): Reduction of wasteful, uneconomic, inefficient or unnecessary consumption of energy

- (a)(1) Prescribe, by regulation, lighting, insulation climate control system, and other building design and construction standards that increase the efficiency in the use of energy and water…
- Warren Alquist Act Signed into law in 1974 by Governor Ronald Reagan

Policy Drivers For Building Standards

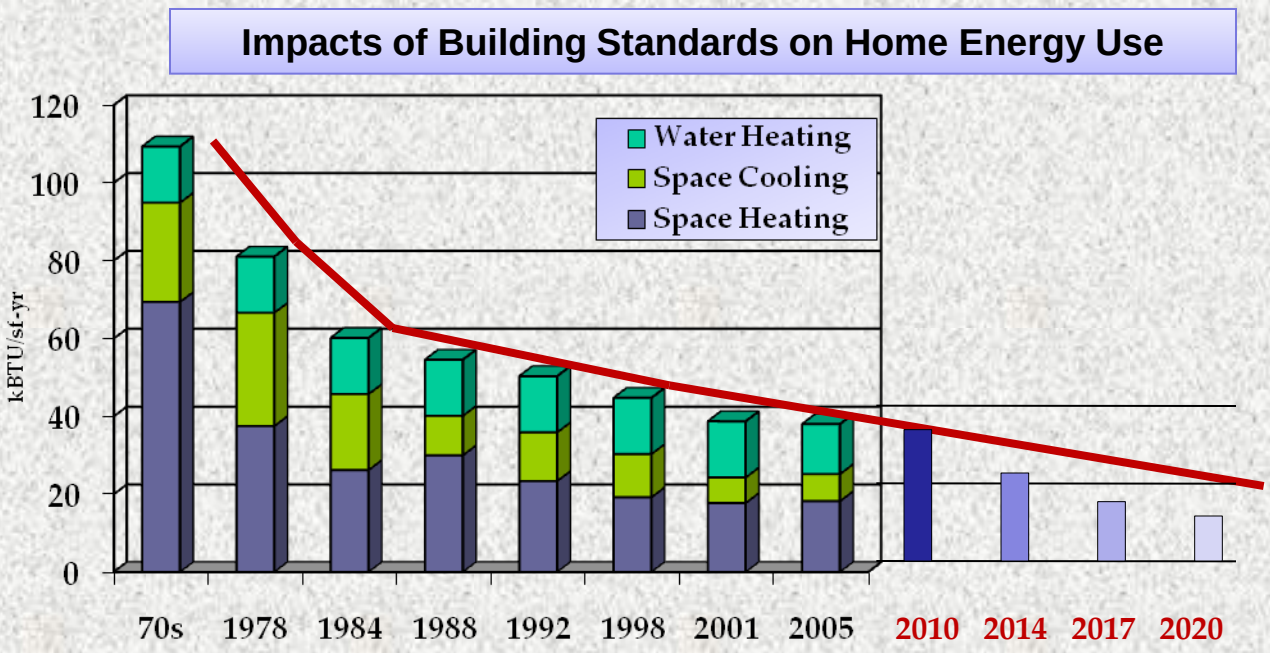
- Governor's “Clean Energy Jobs Plan”
- Zero Net Energy: Residential by 2020 and Nonresidential by 2030
- CARB Climate Change Scoping Plan
- California Long Term Energy Efficiency Strategic Plan



Paul Chinn / The Chronicle

Zero Net Energy Standards

- Achieve additional energy savings from building components regulated under Title-24 to reach ZNE goals
- Integrate onsite generation into building code to accomplish ZNE



Title 24
2016
Standards

2016 Standards Update Schedule

April 4, 2014	CBIA/CEC Standards Forum
May 2014	IOU CASE Stakeholder Meetings
June – Aug 2014	CEC Staff Public Workshops
November 2014	Draft 2016 Standards
January 2015	Release 45-day Language
April 2015	Release 15-Day Language
May 2015	Adoption at Business Meeting
January 1, 2017	Effective Date of the Standards

Dates in blue indicate the calendar week targeted - the event is not scheduled for this particular date

2016 Standards Staff Workshop Schedule - Completed

Staff Workshops	April 29 10:00 Hearing Room A	June 12 9:00 Hearing Room B	June 24 9:00 Hearing Room A	July 9 (NOTE: This is a Commissioner Workshop) 09:00 Hearing Room A	July 21 10:00 Hearing Room A	July 23 10:00 Hearing Room B (This may become a PM meeting)	August 6 10:00 Hearing Room A
Measures	TDV LCC	Opaque envelope U-factors HVAC and WH Equipment Efficiency Thermally Driven Cooling Door and Windows Switch Controls Fan efficiency Direct digital Controls HVAC Economizer Modifications Elevator Lighting and HVAC Controls Escalator and Moving Walkway Speed Controls	Residential Lighting Nonresidential Indoor Lighting Power LPDs Nonresidential Lighting Control and Partial On Occupancy Sensors Outdoor lighting LPAs Outdoor lighting controls, Including Bi-level controls	TDV LCC	HPAD/DCS Minimize Duct Losses Residential High Performance Walls Tankless Water Heaters Res HVAC Field Verification and Diagnosis	Residential ACM Nonresidential ACM PV Credit Whole House Fan Credit	CalGREEN

Dates in blue indicate the calendar week targeted - the event is not scheduled for this particular date

2016 Standards Update Process

Standards Update Includes the Following Phases:

Pre-Rulemaking

1. Stakeholder Meetings - IOU/POU CASE Teams
2. Staff Workshops – Draft Standards

Rulemaking:

1. 45-day language
2. 15-Day language
3. Adoption Business Meeting

2016 Standards Update Process

Pre-Rulemaking

Stakeholder Meetings - IOU/POU CASE Teams

1. Held throughout the state by the utilities
2. Invite diverse group of stakeholders
3. One or two meetings per topic area
4. Present the CASE measure and seek comments
5. Consider the comments and modify the CASE reports
6. Submit all CASE reports to the Commission for staff workshops
7. The utility sponsors include, PG&E, SCE, SDG&E, So Cal Gas, SMUD, and LADWP

2016 Standards Update Process

Pre-Rulemaking - Continued

Staff Workshops

1. Held by staff at the Energy Commission
2. Open to the public
3. Generally one workshop per measure, sometimes two
4. Invite diverse group of stakeholders
5. Seek public comment on measures
6. The result will be the 2016 draft Standards

2016 Standards Update Process

Rulemaking :

Presided Over By The Lead Commissioner

1. 45-day language hearing
2. 15-day language hearing

Adoption Business Meeting – Entire Energy Commission

2016 Residential Standards Vision

2016 Standards Approach Is A Departure From The Past

1. Not focused on a specific measure(s)
2. Define ZNE goals and energy use index (EUI) target or U-factor
3. Provide the builders a range of options to meet the ZNE goals
4. Builders and manufacturers can come up with additional solutions with the same efficiency potentials for meeting the ZNE goals
5. Different builders based on their preferences choose unique prescriptive solutions or compliance options that work for them
6. Free market will settle on the most promising solutions
7. Create “buildable” prescriptive packages that builders can use to meet ZNE goals without using performance path – possible relaxation of west-facing glass limit

The rest of the day will demonstrate how this approach works

2016 Standards Range of Options - HPA

The builder may choose one option described in A or B below:

A. High Performance Attics (HPA) - Vented Attics:

1. Roof deck insulation equivalent to R-6 continuous insulation (CI) with RB, and tile roof as reference design
2. Insulation choices may include CI, spray foam, batt, blown-in, and SIP panels
3. Reversed Half SIPS
4. Below deck blown-in insulation with boxed or draped netting
5. Combining reflective roofs with roof deck insulation or insulation embedded into the roofing material
6. Or other solutions suggested by the industry

B. Or, one of the following prescriptive alternatives to HPA:

1. Ducts in conditioned space (DCS)
2. Non-vented or sealed attics with CI, spray foam, or blown-in boxed or draped netting
3. Ductless systems
4. Or other solutions suggested by the industry

Above Rafters Insulation Options – Vented Attic

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Above Rafters Insulation Options – Vented Attic

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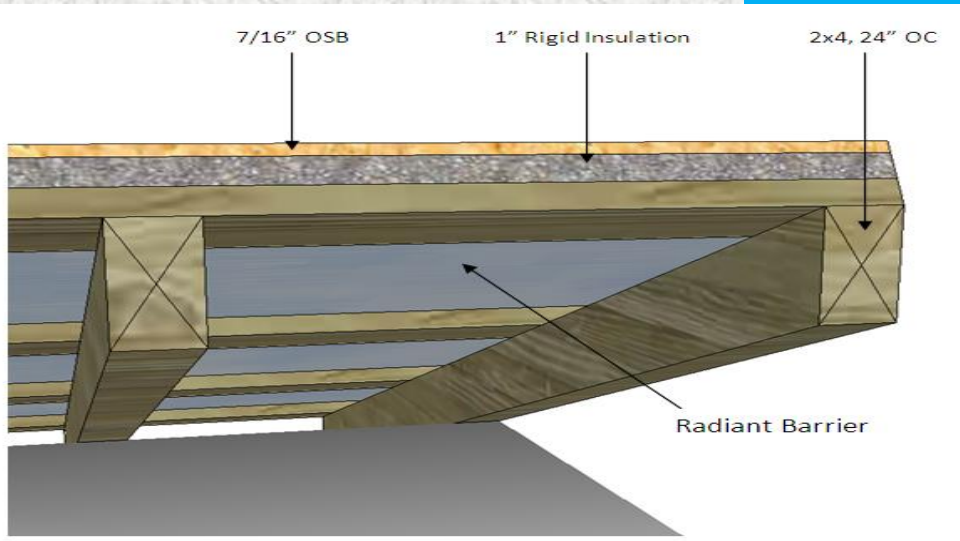
2016 Standards Range of Options - HPW

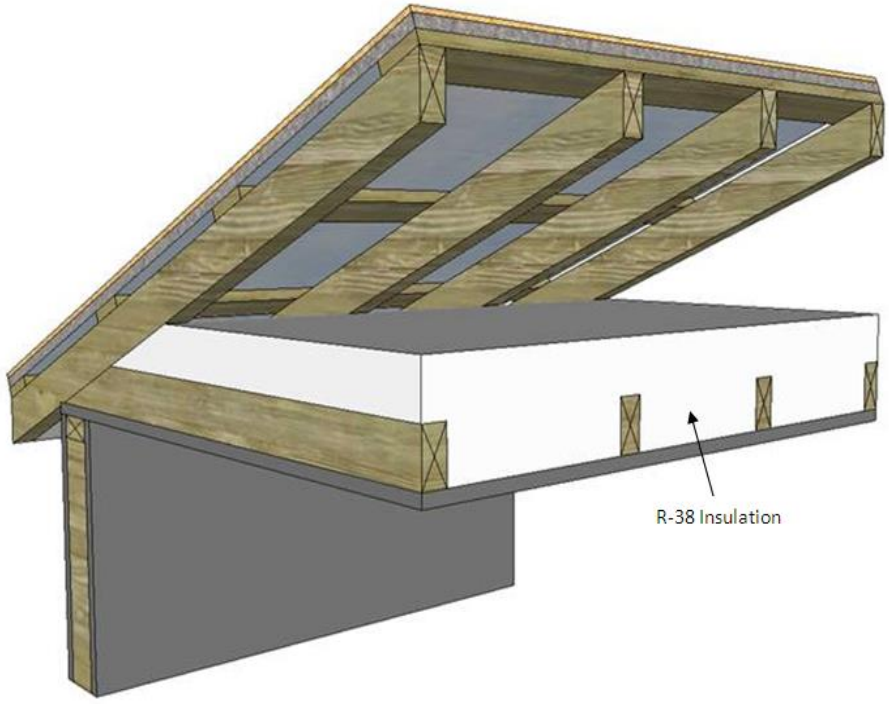
Reversed Half-SIPS:

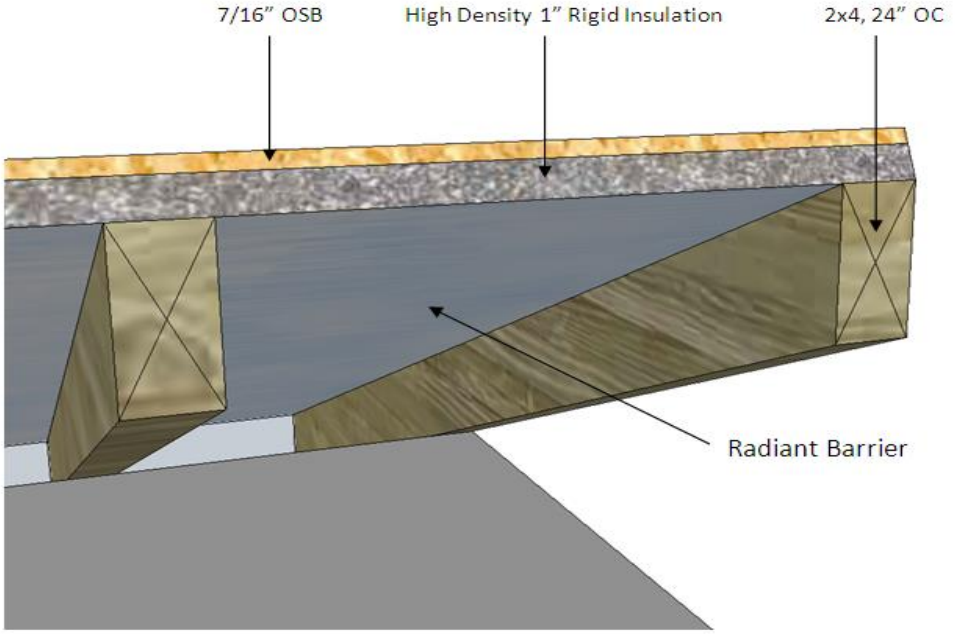
Conventional vented attics

Little change to common building construction practice

Can work with all roofing products

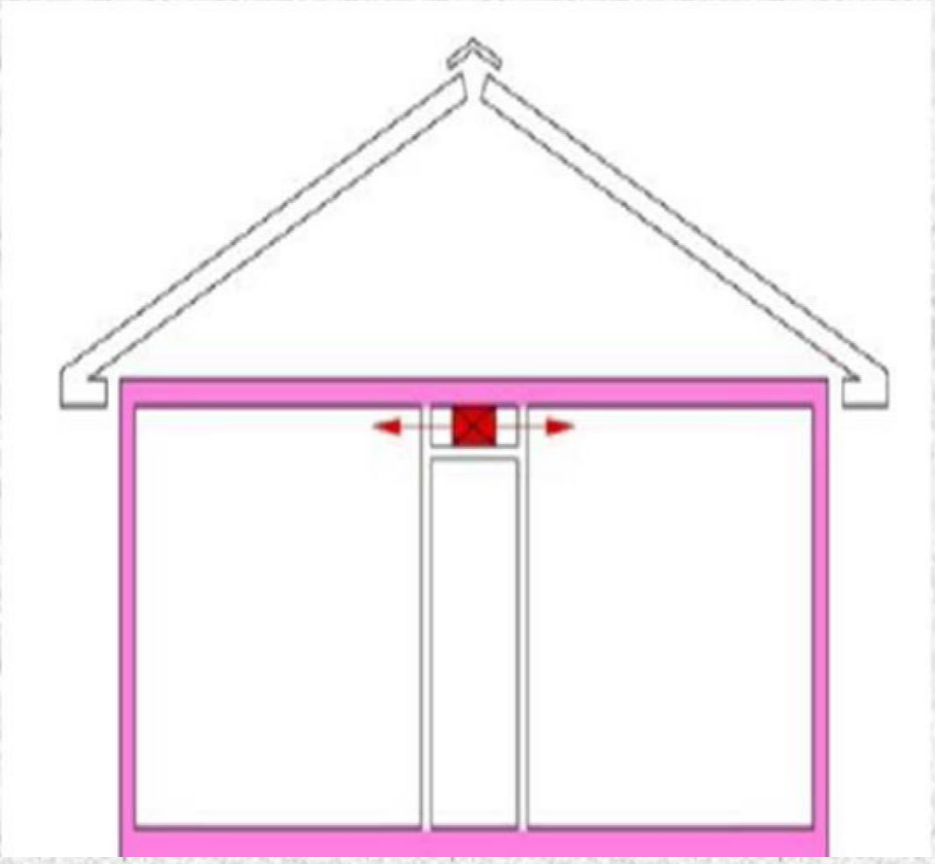


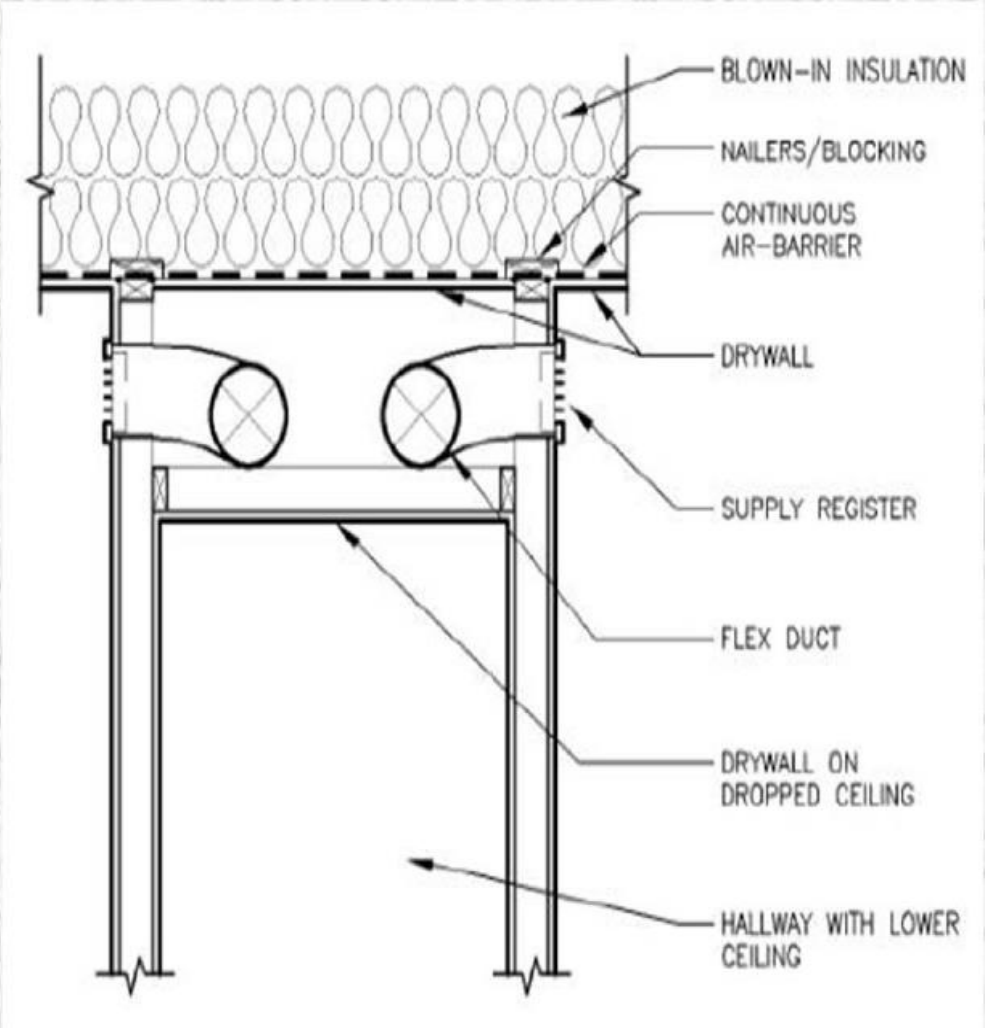




Ducts in Conditioned Space - Vented Attic

Ducts in Dropped Ceilings





Example: DCS – Dropped Ceiling

Source: BIRA Energy, 2014

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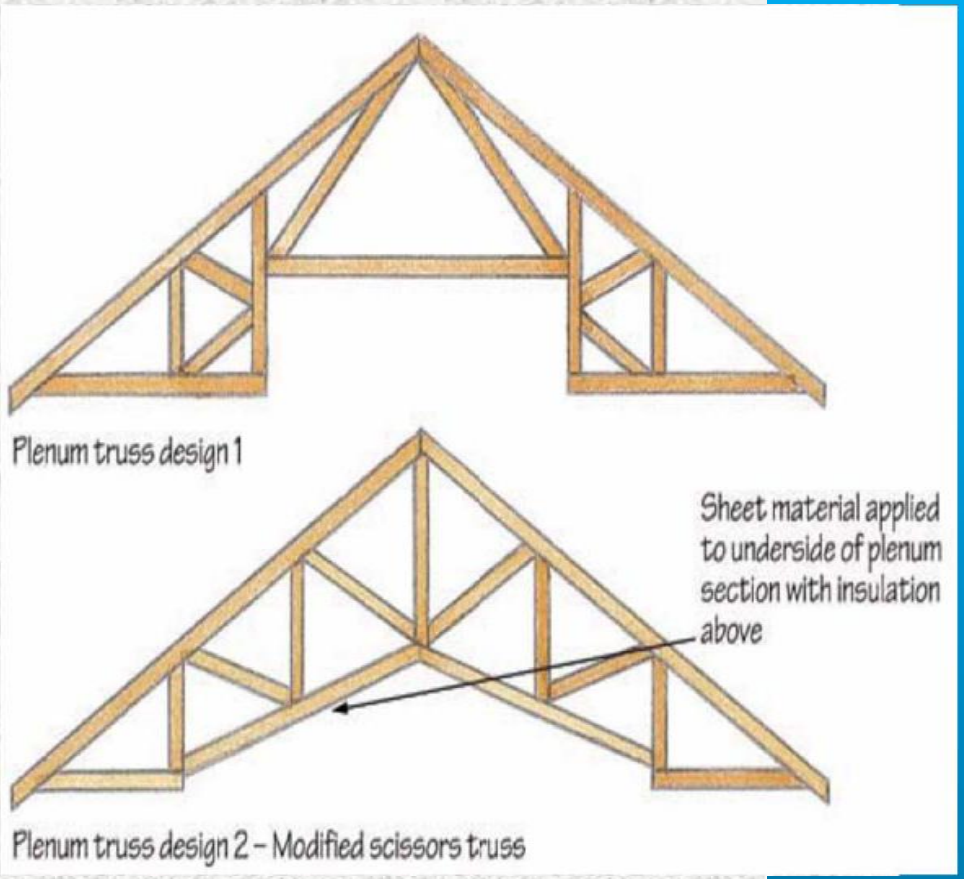
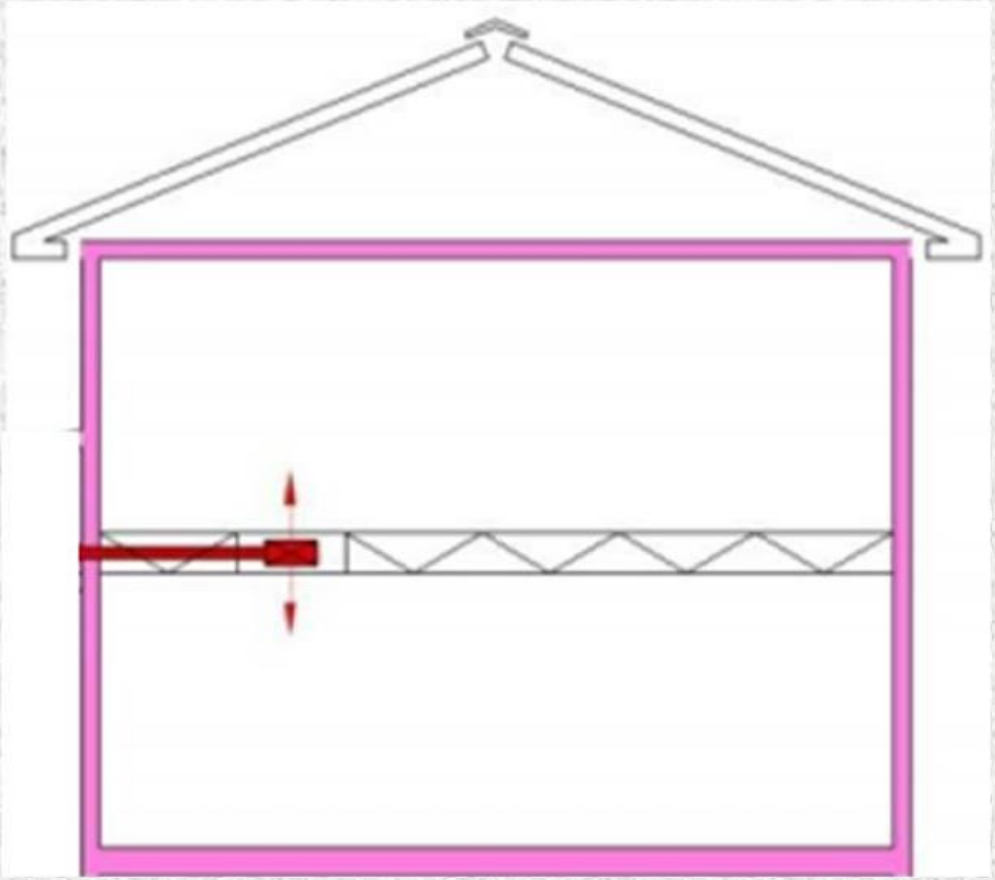
Ducts in Conditioned Space - Vented Attic

Ducts in Conditioned Plenum or "Dog House" – Above Ceiling Plane



Ducts in Conditioned Space - Vented Attic

Conditioned space for ducts in vertical space between floors



Below Deck Insulation – Unvented Attic

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Below Deck Insulation – Unvented Attic

Boxed Netting – R30 Below Deck Insulation

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2016 Standards Range of Options - HPW

And Choose one of the following High Performance Walls (HPW) options – U-Factor (Approx 0.048 – 0.050) equivalent to R15 + R8 CI using one of the following strategies:

1. 2x4 @ 16” OC with R-8 CI, using high R-value CI
2. 2x6 @ 16” OC with R-5 CI
3. 2x6 @ 24” OC with R-4 CI – Advanced Wall Framing
4. Staggered studs with batt insulation or spray foam
5. Structurally Insulated Panels (SIPs)
6. Or other solutions suggested by the industry

Proposed Prescriptive Standard Wall

U-factor of 0.050

1. 2x4 @ 16”OC, R15 + R8 (.050)
2. 2x6 @ 16”OC, R19 + R6 (.048):
3. 2x6 @ 16” OC, R21 + R5 (.048)
4. 2x6 AWF R19 + R5 (0.048)

2016 Standards Range of Options

Or choose a compliance option below as an alternative to HPA or HPW:

- Photovoltaic tradeoff compliance option to trade away the HPA, HPW, or both
- Other available compliance options include but not limited to advanced whole house fans and high performance windows

2016 Standards Other Measures

Tankless Water Heaters

Tankless water heater as basis of Prescriptive and Performance Approaches – Energy Factor of 0.82

Prescriptive Alternative:

- Standard Storage WH, EF of 0.62, plus
- QII, plus either of
  - Compact design, or
  - Insulating all 0.5 inch hot water pipes

2016 Standards Other Measures

High Efficacy Lighting

1. All high efficacy lighting in kitchens throughout the house
2. All recessed downlights high efficacy
3. Allow luminaires with medium base socket as high efficacy if the socket is populated with a Cal high quality LED lamp at the time of inspection - except for downlights

2016 Standards – Measure Costs

2016 Standards Measure Incremental Costs Per Single Family Dwelling

1.	High Performance Attics:	Vented Attic, R-38 Ceiling + R-13 Below Deck Blown-in Cellulose and Netting = **$894**
2.	High Performance Walls:	2x6 R-19 + R-6 CI, U-Factor 0.049 = **$477**
3.	Tankless Water Heater:	**$725**
4.	High Efficacy Lighting:	**$525**
	Total Costs Per Dwelling:	**$2,621**

Energy Commission/CPUC/Utility/CBIA HPA & HPW Code Readiness Initiative

- **Support CBIA builders in preparing for 2016 Code change in building practice for High Performance Attics and High Performance Walls**
- **Design Assistance – Utilities provide financial support to builder teams to integrate HPA/HPW into builder plans and construction process**
  - Architects, structural engineers, superintendants, installers, contractors, suppliers, marketing – “value engineering”
- **In-field Training of Trades – Utilities provide financial support and direct training in conjunction with suppliers on measures chosen by builders to implement HPA/HPW**
- **Targeted Incentives – Utilities provide package of incentives to bring down the cost of HPA/HPW measures**
- **Collaborative Campaign – Work in consort with CBIA to encourage builder participation and satisfaction**

2016 Standards – Life Cycle Costing

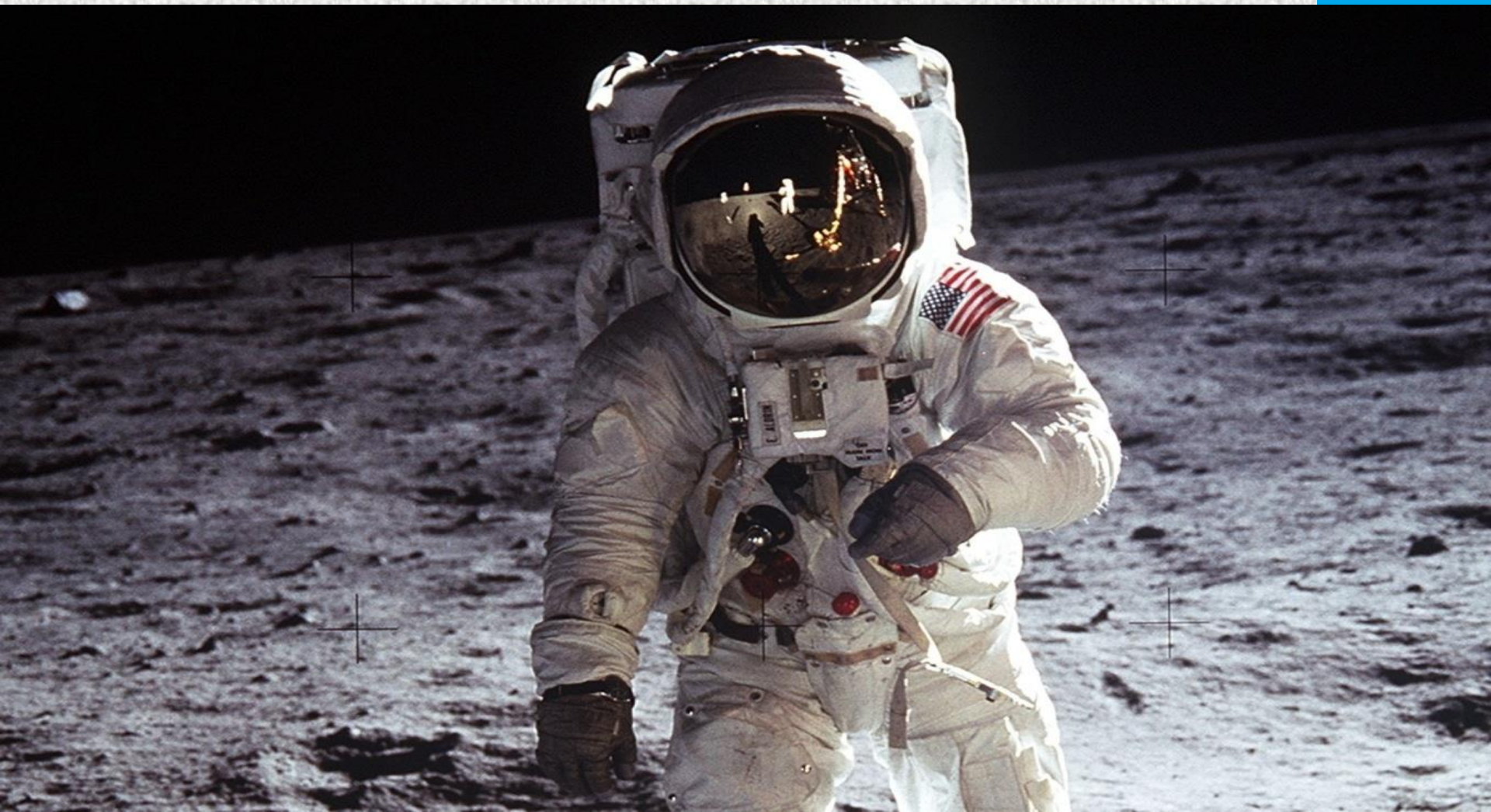
Standards measures must be cost effective

1. Using Life Cycle Costing Methodology (LCC)
   - i. Discounted cash flows for costs and benefits
   - ii. Accounts for maintenance costs/benefits
   - iii. Appropriate discount rates and life of measures - 30 years for residential measures

2. Time Dependent Valuation (TDV)
   - i. Value of gas and electricity changes depending on the season and the time of day
   - ii. 8,760 TDV multipliers for each hour of the year
   - iii. Favors measures that save energy during high demand periods

The ZNE Challenge: Cold Ducts In Hot Attics

And finally, the old cliché: *A nation that put a man on the moon nearly half a century ago, should be able to figure out how to temper the hot attic environment in our cooling climate zones.*



The ZNE Forum Space Trivia/Mystery

•In August of 2014, while the Russian cosmonauts were performing a routine maintenance of the exteriors of the International Space Station (ISS), they found a substance on the exterior surfaces that surprised the scientists back on Earth. What was the substance that the cosmonauts found on the ISS?

Questions?